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Patent Claims

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1. A device for determining the state of a soot particle filter (13) of an internal combustion engine, having an electrical measuring arrangement embodied as a soot sensor for measuring a soot deposit, comprising

10 - an electrical component with a conductor structure for exciting an electrical or magnetic field which can be influenced by the soot deposit and characterizes an electrical or magnetic characteristic variable of the component,

15 - and measuring means (24) for measuring the electrical or magnetic characteristic variable of the component as a measure of a quantity of the soot deposit,

20 characterized in that the conductor structure is arranged in such a way that a partial volume region of the soot particle filter (13) is penetrated by the electrical field and the partial volume region forms part of the component.

25 2. The device as claimed in claim 1, characterized in that the soot deposit can be measured in partial volume regions of the soot particle filter (13) which are different from one another.

30 3. The device as claimed in claim 1 or 2, characterized in that a characteristic variable of the component which is linked to the electrical impedance can be measured by the measuring means (24).

35 4. The device as claimed in claim 3, characterized in that the absolute value and/or phase of the electrical impedance can be measured.

5. The device as claimed in one of the preceding claims, characterized in that the ohmic resistance and/or the capacitance and/or the inductance of the component can be measured.

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6. The device as claimed in one of the preceding claims, characterized in that switching means are provided for automatically initiating regeneration of the filter when a predefinable triggering measured value is reached.

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7. The device as claimed in one of the preceding claims, characterized in that switching means are provided for automatically ending the regeneration of the filter when a predefinable limiting measured value is reached.

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8. The device as claimed in one of the preceding claims, characterized in that temperature measuring means are provided for measuring the temperature of the filter and/or for performing temperature compensation on the measurement signal.

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9. The device as claimed in one of the preceding claims, characterized in that a coil-shaped conductor structure (39) is provided.

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10. The device as claimed in claim 9, characterized in that the coil-shaped conductor structure (39) is arranged at least partially in the interior of the soot particle filter (13).

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11. The device as claimed in claim 9, characterized in that the coil-shaped conductor structure (39) is arranged outside the soot particle filter (13).

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12. The device as claimed in one of claims 9 to 11, characterized in that the soot particle filter (13) is cylindrical in shape and the coil longitudinal axis of

the coil-shaped conductor structure (39) is oriented approximately parallel or approximately perpendicular with respect to the longitudinal axis of the soot particle filter (13).

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13. The device as claimed in one of claims 9 to 12, characterized in that the measuring arrangement comprises a second conductor structure, the coil-shaped conductor structure (39) being operatively connected to 10 the second conductor structure, and the second conductor structure having an electrical characteristic variable which can be influenced by the soot deposit (38) and can be measured by the measuring means (24).

15 14. The device as claimed in claim 13, characterized in that the second conductor structure is embodied as a second coil-shaped conductor structure (39') and a variable which correlates to the mutual inductance 20 which is effective between the coil-shaped conductor structures (39, 39') can be measured by the measuring means (24).

15. The device as claimed in claim 13 or 14, characterized in that the coil-shaped conductor structure (39) is arranged in the direction of flow of the exhaust gas with an offset with respect to the 25 second conductor structure.

16. The device as claimed in one of claims 1 to 8, 30 characterized in that the conductor structure comprises a pair of electrodes (20, 21; 22, 23; 25, 26; 27, 28; 29, 30; 31, 32; 31', 32') with a first electrode (20, 22, 25, 27, 29, 31) and a second electrode (21, 23, 26, 28, 30, 32, 32') which is arranged spaced apart 35 from the first electrode (20, 22, 25, 27, 29, 31), the partial volume region being arranged between the first electrode (20, 22, 25, 27, 29, 31, 31') and the second electrode (21, 23, 26, 28, 30, 32, 32').

17. The device as claimed in claim 16, characterized in that the first electrode (20, 22, 29, 31, 31') and the second electrode (21, 23, 30, 32, 32') are of planar design and are arranged opposite one another as 5 plates of a plate capacitor.

18. The device as claimed in claim 16 or 17, characterized in that the first electrode (20, 22, 25, 10 27, 29, 31, 31') and/or the second electrode (21, 23, 26, 28, 30, 32, 32') are arranged on the outer surface of the soot particle filter (13) or at a short distance from the outer surface of the soot particle filter (13).

15 19. The device as claimed in one of claims 16 to 18, characterized in that the measuring arrangement comprises at least two pairs of electrodes.

20. The device as claimed in claim 19, characterized in that the first pair of electrodes is arranged in the flow of exhaust gas with an offset with respect to the second pair of electrodes.

25 21. The device as claimed in one of the preceding claims, characterized in that a second electrical measuring arrangement which is effective as a soot sensor (16) for measuring a soot deposit is provided and is arranged downstream of the soot particle filter (13) with respect to the direction of flow through the 30 soot particle filter (13).